REMARKS

Claims 1-24 are pending in this application, of which claims 1, 5, 9, 10, 16, 19 and 22 have been amended. No new claims have been added.

Claims 9 and 22 stand rejected under 35 USC §102(a) as anticipated by JP 2000040838 (hereinafter "**JP '838**").

Applicants respectfully traverse this rejection.

JP '838 discloses an abnormality detector for a solar power plant which compares the power of a solar battery with a theoretical value and outputs an abnormality signal when the comparison value is greater than fixed value.

The theoretical value for solar energy is obtained from a sunlight energy sensor 3.

The Examiner has urged that the "predetermined theoretical value" obtained from the sunlight energy sensor 3 meets the limitations of "past measurement result" of an output characteristic of said photovoltaic power system, as recited in claim 9.

Applicants respectfully disagree. There is no suggestion in **JP '838** that the "theoretical value" has anything to do with past measurement results of the output characteristic of the photovoltaic power system. The "theoretical value" may be determined without any such past measurement result of this system.

Accordingly, claim 22 has been amended to recite that the storage unit stores such a past measurement result for use in diagnosing the normality/abnormality of the output of the photovoltaic power system.

Thus, the 35 USC §102(a) rejection should be withdrawn.

Claims 22 and 23 stand rejected under 35 USC §102(a) as anticipated by JP 2000022192 (hereinafter "**JP '192**").

Applicants respectfully traverse this rejection.

Like **JP '838** discussed above, **JP '192** fails to disclose that past measurement results are taken into account in the normality/abnormality determination.

Thus, the 35 USC §102(a) rejection should be withdrawn.

Claims 1-8, 10-21 and 24 stand rejected under 35 USC §103(a) as unpatentable over **JP '192** (Mitsubishi) in view of U.S. Patent 5,594,313 to Takeda (hereinafter "**Takeda**").

Applicants respectfully traverse this rejection.

Takeda discloses a solar cell system which stores electric power generated by solar cells and supplies the electric power to a load. This system includes a solar cell assembly having a capacity for generating electric power in a quantity consumed by the load in one day, the quantity being determined from an estimated quantity of solar radiation available on a rainy or cloudy day, and an electric double layer capacitor having a storage capacity corresponding at least to the quantity consumed by the load in one day.

Column 1, lines 24-41 disclose:

> Assuming that the load consumes electric power PL per day, output PS of the solar cells (in fine weather) is expressed by the following equation:
>
> $PS=K\times PL$.
>
> In the above equation, correction factor K is variable with the installation site or region, and generally is selected from within the

range of 1 to 4.

The relationship between the correction factor K and sunlight hours is derived empirically from results of actual operating tests and the like carried out on the most standard, independent power source combining solar cells and the storage battery. Correction factor K embraces variations with temperature changes of solar cell output occurring throughout the year, and correction values for the storage battery efficiency and the like.

Neither **JP '192** nor **Takeda** teaches, mentions or suggests that the photovoltaic power system is diagnosed as normal only if said measured output characteristic is greater than a first predetermined value and less than a second predetermined value, said first and second predetermined values being based on said reference output characteristic, as disclosed on page 14, lines 1-17 of the specification of the instant application, where the first and second predetermined values are based on the diagnosis reference value × r or s, where r is the lower limit diagnosis factor and s is the upper limit diagnosis factor.

JP '192 teaches a comparison based on a single preset value.

Accordingly, claims 1 and 16 have been amended to recite this feature.

Furthermore, contrary to the Examiner's assertion, neither of the cited references teaches, mentions or suggests obtaining a reference output characteristic at the time of normal operation in accordance with a past measurement result of an output characteristic of said photovoltaic power system, as recited in claim 10 of the instant application, or the use of a measurement result of a second photovoltaic power system different from a first photovoltaic power system, as recited in claim 15 of the instant application.

Neither **JP '192** nor **Takeda** teaches, mentions or suggests the step of calculating a reference output characteristic in accordance with an installation condition of a photvoltaic power system, as recited in claims 5 and 19 of the instant application.

Thus, the 35 USC §103(a) rejection should be withdrawn.

In view of the aforementioned amendments and accompanying remarks, claims 1-24, as amended, are in condition for allowance, which action, at an early date, is requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, WESTERMAN & HATTORI, LLP

William L. Brooks
Attorney for Applicant
Reg. No. 34,129

WLB/mla
Atty. Docket No. **010251**
Suite 1000, 1725 K Street, N.W.
Washington, D.C. 20006
(202) 659-2930

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PATENT TRADEMARK OFFICE

Enclosures: Version with markings to show changes made

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VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/800,515

IN THE SPECIFICATION:

Amend the specification as follows:

Insert the heading before the paragraph beginning at page 1, line 6 as follows:

1. Field of the Invention

Paragraph beginning at page 1, line 6 has been amended as follows:

The present invention relates to a method and an apparatus for diagnosing a photovoltaic power system provided in a house, or the like and, in particular to a diagnosis method and a diagnosis apparatus of a photovoltaic power system which diagnoses the normality/abnormality of the output and which, if necessary, diagnoses the cause of the abnormality.

Insert the heading before the paragraph beginning at page 1, line 12 as follows:

2. Description of the Related Art

Paragraph beginning at page 1, line 12 has been amended as follows:

Conventionally, photovoltaic power, which has very little effect on the [earths] earth's environment and which generates electricity through the [usage] use of solar energy has been considered the most promising clean energy for the future, unlike thermal power generation in which fossil fuels undergo combustion and in which large amounts of carbon dioxide are discharged

leading to global warming, hydroelectric power generation which has the difficulty of securing installation sites or atomic power generation which has the problem of the disposal of waste, or the like. [Then, in] In recent years, the spread to residential houses of the photovoltaic power system has expanded in accordance with the introduction of financial assistance from public organizations.

Paragraph beginning at page 1, line 24 has been amended as follows:

Such a photovoltaic power system comprises a solar battery panel, having a plurality of solar battery cells electrically connected in series, which is mounted on a roof, or the like[,]; an inverter, which converts the direct current output from the solar battery panel to an alternating current output[,]; and wires, which make connections between the solar battery panel and the inverter as well as between the inverter and the loads[, and the like]. Then, when the solar rays irradiate the solar battery panel, a photovoltaic conversion is carried out in each solar battery cell and these conversion outputs are collected so as to generate direct current power and, then, this direct current power is converted to alternating current power by the inverter so as to be supplied to the loads.

Paragraph beginning at page 1, line 11 has been amended as follows:

In order to stably gain a desired electric energy to be supplied to the loads, it is necessary to monitor whether or not the photovoltaic power system operates normally so as to take measures after quickly discovering the cause in the case that it is found that the output is abnormal. However, a system wherein the diagnosis, of whether or not the operation of the photovoltaic power system is normal, is carried out simply and with a high precision has not yet been constructed. Though a

variety of methods for detecting abnormalities of each component of a solar power system have been conventionally known, there is a problem that, in the case that the output of the photovoltaic power system is abnormal, the work of the discovery of the cause by inspecting each component using such methods takes a long period of time. In addition, there is a problem in that the work of the discovery of the cause cannot be carried out in the case that the output of the system becomes abnormal in spite of the fact that each component operates normally.

Heading beginning at page 3, line 4 has been amended as follows:

[BRIEF] SUMMARY OF THE INVENTION

Paragraph beginning at page 3, line 9 has been amended as follows:

Another object of the present invention is to provide a [diagnose] diagnosis method and a diagnosis apparatus of photovoltaic power system which can not only diagnose the normality/abnormality of the output but can also quickly diagnose the cause of the [abnormal case] abnormality.

Paragraph beginning at page 3, line 18 has been amended as follows:

In a diagnosis method and apparatus according to the first aspect of the invention, a reference output characteristic at the time of normal operation that is obtained in accordance with the installation condition and an output characteristic obtained during actual operation are compared and the comparison result is [considered] evaluated to diagnose the normality/abnormality of the output

of the photovoltaic power system. Therefore, a precise diagnosis result can be quickly [gained] obtained.

Paragraph beginning at page 4, line 1 has been amended as follows:

In a diagnosis method and apparatus according to [the] a second aspect of the invention, the reference output characteristic at the time of normal operation is calculated in accordance with the installation condition and the calculated reference output characteristic and the output characteristic which has actually been measured are compared and the comparison result is [considered] evaluated in order to diagnose the normality/abnormality of the output of the photovoltaic power system. Accordingly, the reference output characteristic is calculated in accordance with the installation condition and, therefore, it is not necessary to store, in a memory, a [lot] large number of reference output characteristics in accordance with a variety of installation conditions so as to be able to correspond to all installation conditions.

Paragraph beginning at page 4, line 14 has been amended as follows:

According to [the] a third aspect of the invention, as for the installation condition of the photovoltaic power system according to the first or the second aspect of the invention, site (longitude, latitude, topography, meteorological condition, or the like), direction (16 directions), angle (inclination angle with respect to the ground), configuration (types of solar batteries, number of cells in series, total area of cells (panel area)) are used. Accordingly, precise data of the reference output characteristic can be obtained and, together with that, the diagnosis result becomes precise.

Paragraph beginning at page 4, line 23 has been amended as follows:

According to [the] a fourth aspect of the present invention, the output characteristic measured in the first or [the] second aspect of the invention is stored in a memory. Accordingly, a diagnosis process can be carried out at an arbitrary point of time.

Paragraph beginning at page 5, line 2 has been amended as follows:

In a diagnosis method and apparatus according to [the] a fifth aspect of the invention, [the] a past output characteristic is preserved and this output characteristic is taken into consideration [to diagnose] in diagnosing the normality/abnormality of the photovoltaic power system. Accordingly, a precise diagnosis result can be quickly [gained] obtained by taking into consideration the effect of the characteristic particular to the photovoltaic power system to be diagnosed.

Paragraph beginning at page 5, line 9 has been amended as follows:

In a diagnosis method and apparatus according to [the] a sixth aspect of the invention, the reference output characteristic at the time of normal operation is obtained in accordance with the past output characteristic and the obtained reference output characteristic and the output characteristic which has actually been measured are compared so that the comparison result is taken into consideration so as to diagnose the normality/abnormality of the output of the photovoltaic power system. Accordingly, the reference output characteristic is obtained in accordance with the actual output characteristic of the past and, therefore, the optimal reference output characteristic suitable

for each photovoltaic power system can be easily obtained so as to quickly [gain] obtain a precise diagnosis result.

Paragraph beginning at page 5, line 22 has been amended as follows:

According to [the] a seventh aspect of the invention, the reference output characteristic is made to be different for each of a plurality of time periods, gained by dividing up a year in the sixth aspect of the invention. The output characteristic in a photovoltaic power system is easily influenced by seasonal changes in the meteorological condition (air temperature, solar radiation time, sun altitude, or the like). Therefore, a standard output characteristic suitable for the meteorological condition is set for each of a plurality of time periods (monthly unit, seasonal unit, or the like) in a year. Accordingly, the reference output characteristic which is always optimal throughout the year can be obtained so as to quickly [gain] obtain a precise diagnosis result.

Paragraph beginning at page 6, line 9 has been amended as follows:

In [the] an eighth aspect of the invention, only the output characteristic at the time of the normal case, as a result of a diagnosis in the sixth or the seventh aspect of the invention, is reflected in the reference output characteristic for the next time. Accordingly, the output characteristic of the abnormal case is not reflected in the reference output characteristic for the next time and, therefore, a reference output characteristic with a high precision can always be obtained.

Paragraph beginning at page 6, line 17 has been amended as follows:

In a diagnosis method and apparatus according to [the] a ninth aspect of the invention, the reference output characteristic used for the diagnosis of the normality/abnormality of the first photovoltaic power system of to be diagnosed is obtained in accordance with the output characteristic of the second photovoltaic power system. Accordingly, even in the first photovoltaic power system which is newly set, the reference output characteristic thereof is obtained by considering the output characteristic of the second photovoltaic power system during actual operation which has a similar installation condition and system characteristic and, therefore, a precise reference output characteristic can easily be obtained.

Paragraph beginning at page 7, line 3 has been amended as follows:

In a diagnosis method and apparatus according to [the] a tenth aspect of the invention, the comparison result of comparing the reference output characteristic at the time of normal operation with the output characteristic during actual operation, in the first to the ninth aspects of the invention, is considered so as to diagnose the cause of the case where the output is abnormal. Accordingly, the cause of the abnormality can be quickly discovered so as to take immediate measures.

Paragraph beginning at page 7, line 11 has been amended as follows:

In a diagnosis method and apparatus according to [the] an eleventh aspect of the invention, as for the reference output characteristic and the output characteristic in the first to the tenth aspects of the invention, a direct current voltage, an alternating current voltage, a direct current electric energy, an alternating current electric energy, or the like, are used. Accordingly, a diagnosis can be

carried out from multiple points of view and not only the cause [due to] resulting from the abnormality of a component but also other causes can be diagnosed.

Paragraph beginning at page 7, line 20 has been amended as follows:

In a diagnosis method and apparatus according to [the] a twelfth aspect of the invention, the actual amount of solar radiation during the operation of the photovoltaic power system is measured. Accordingly, data of the amount of solar radiation can be acquired as the data for diagnosis so as to carry out a diagnosis from a greater number of multiple points of view [of a greater number].

Heading beginning at page 8, line 5 has been amended as follows:

BRIEF DESCRIPTION OF THE [SEVERAL VIEWS OF THE] DRAWINGS

Paragraph beginning at page 8, line 7 has been amended as follows:

FIG.1 is a schematic diagram showing [the] a first embodiment [of the case where] of the present invention in which a diagnosis of a photovoltaic power system is carried out by using a diagnosis apparatus of photovoltaic power system [according to the present invention];

FIG.2 is a flow chart showing an operation procedure of the diagnosis apparatus of photovoltaic power system according to the first embodiment;

FIG.3 is a schematic diagram showing [the] a second embodiment [of the case where] of the present invention in which a diagnosis of a photovoltaic power system is carried out by using a diagnosis apparatus of photovoltaic power system [according to the present invention];

FIG.4 is a flow chart showing an operation procedure of the diagnosis apparatus of photovoltaic power system according to the second embodiment;

FIG.5 is a schematic view showing [the] a third embodiment [of the case where] of the present invention in which a diagnosis of a photovoltaic power system is carried out by using a diagnosis apparatus of photovoltaic power system [according to the present invention];

FIG.6 is a flow chart showing an operation procedure of the diagnosis apparatus of photovoltaic power system according to the third embodiment;

FIG.7 is a flow chart showing a procedure of a diagnosis process according to the present invention;

FIG.8 is a flow chart showing a procedure of a diagnosis process according to the present invention;

FIG.9 is a graph showing the relationship between the reference output characteristic (direct current voltage) at the time of normal operation and the actually measured output characteristic (direct current voltage);

FIG.10 is a graph showing the relationship between the reference output characteristic (direct current voltage) at the time of abnormal operation and the actually measured output characteristic (direct current voltage);

FIG.11 is a graph showing the relationship between the reference output characteristic (electric energy) at the time of normal operation and the actually measured output characteristic (electric energy); and

FIG.12 is a graph showing the relationship between the reference output characteristic

(electric energy) at the time of abnormal operation and the actually measured output characteristic (electric energy).

Heading beginning at page 9, line 24 has been amended as follows:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE PRESENT INVENTION

Paragraph beginning at page 9, line 25 has been amended as follows:

In the following, the present invention is described based on the drawing showing the preferred embodiments.

Paragraph beginning at page 10, line 3 has been amended as follows:

FIG.1 is a schematic diagram showing the first embodiment [of the case where] in which a diagnosis of a photovoltaic power system is carried out by using a diagnosis apparatus of photovoltaic power system according to the present invention.

Paragraph beginning at page 10, line 7 has been amended as follows:

A solar battery panel 21 which has a plurality of solar battery cells 20 electrically connected in series is attached to the roof 31 of a house 30 at a predetermined angle with respect to the ground surface. [The] A wire 22 for taking out the output of the solar battery panel 21 is connected to a power adjuster 24 which has an inverter 23 for converting a direct current output to an alternating

current output. In addition, [the] a wire 25 for the output from the power adjuster 24 is connected to [the] a load 26, comprising a variety of electric appliances.

Paragraph beginning at page 10, line 16 has been amended as follows:

When [the] solar rays irradiate the solar battery panel 21, photovoltaic conversion is carried out in each of the solar battery cells 20 and these conversion outputs are collected so as to generate a direct current power [so that this direct current power] which is converted into an alternating current power by [the] an inverter 23 so that the converted alternating current power is supplied to the load 26.

Paragraph beginning at page 11, line 3 has been amended as follows:

The measurement unit 1 measures the value of the output characteristic of the photovoltaic power system during operation. More [concretely] specifically, the measurement unit 1 chronographically measures the value of the output characteristic (direct current voltage, direct current) before the conversion by the inverter 23 and the output characteristic (alternating current voltage, alternating current, electric power, electric energy) after the conversion. In addition, the measurement unit 1 measures the amount of solar radiation detected by the pyrheliometer 8 installed on the roof 31. Those measured values are stored in the measurement data memory unit 6. Here, each of these measured values is averaged during one segment of one hour so as to be stored in the measurement data memory unit 6. In addition, an abnormal signal of the inverter outputted from the

inverter 23 [in the case that] whenever an abnormality occurs in the inverter 23 is also stored in the measurement data memory unit 6.

Paragraph beginning at page 13, line 2 has been amended as follows:

Here, for example, in the case that the above measurement unit 1 and the diagnosis unit 2 are configured [of] by a CPU, the diagnosis reference value storage unit 3, the diagnosis factor storage unit 4, the program storage unit 5 and the measurement data memory unit 6 are configured of a hard disc device and the output unit 7 is configured of a liquid crystal display, the diagnosis apparatus of photovoltaic power system according to the first embodiment can be configured [of] by one personal computer for all of the function parts, except for the pyrheliometer 8. Or, the above CPU and the hard disc device may be provided within the power adjuster 24 and the output unit 7 alone may be provided within the house.

Paragraph beginning at page 13, line 14 has been amended as follows:

Next, the operation of the diagnosis apparatus of photovoltaic power system according to the first embodiment [that has] having the above configuration is described in reference to the flow chart of FIG.2 which shows the procedure thereof.

Paragraph beginning at page 14, line 19 has been amended as follows:

FIG. 3 is a schematic diagram showing the second embodiment [of the case where] in which a diagnosis of a photovoltaic power system is carried out by using a diagnosis apparatus of

photovoltaic power system according to the present invention. Here, in FIG.3, the same or similar elements as in FIG.1 are denoted as the same numerals, of which the descriptions are omitted.

Paragraph beginning at page 16, line 9 has been amended as follows:

Here, for example, in the case that the above measurement unit 1, the diagnosis unit 2 and the diagnosis reference value calculation unit 11 are configured [of] by a CPU, the diagnosis factor storage unit 4, the program storage unit 5 and the measurement data memory unit 6 are configured of a hard disk device, the output unit 7 is configured [of] by a liquid crystal display and the input unit 12 is configured [of] by a keyboard, the diagnosis apparatus of photovoltaic power system according to the second embodiment can be configured [of] by one personal computer for all of the function parts, except for the pyrheliometer 8. [Or] Alternatively, the above CPU and the hard disc device may be provided within the power adjuster 24 and the output unit 7 alone may be provided within the house.

Paragraph beginning at page 18, line 2 has been amended as follows:

FIG.5 is a schematic diagram showing the third embodiment [of the case where] in which a diagnosis of a photovoltaic power system is carried out by using a diagnosis apparatus of photovoltaic power system according to the present invention. Here, in FIG.5, the same or similar elements as in FIG.1 or Fig. 3 are denoted [as] by the same numerals, of which the descriptions are omitted.

Paragraph beginning at page 19, line 20 has been amended as follows:

Here, for example, in the case that the above measurement unit 1 and the diagnosis unit 2 are configured [of] by a CPU, the diagnosis factor storage unit 4, the program storage unit 5, the measurement data memory unit 6, the base value storage unit 13 and the correction factor storage unit 14 are configured [of] by a hard disk device and the output unit 7 is configured [of] by a liquid crystal display, the diagnosis apparatus of photovoltaic power system according to the third embodiment can be configured [of] by one personal computer for all of the function parts, except for the pyrheliometer 8. [Or] Alternatively, the above CPU and the hard disc device may be provided within the power adjuster 24 and the output unit 7 alone may be provided within the house.

Paragraph beginning at page 21, line 22 has been amended as follows:

In the following, [a concrete] an example of this diagnosis process in the third embodiment is described. Here, the output characteristic which becomes the diagnosis reference is assumed to be electric energy, the diagnosis process in January of every year (for three years) is described.

Paragraph beginning at page 22, line 15 has been amended as follows:

[Since] Because the diagnosis has the result of normal (S27: YES), "normal" is outputted and displayed in the output unit 7 (S28). In addition, the correction factor v of the correction factor storage unit 14 is changed (S29). More [concretely] specifically, the average value 1.1 between actual measured value (120) ÷ base value (100) = 1.2 and present v = 1 is written into the correction factor storage unit 14 as a new correction factor v. In addition, the diagnosis factors r, s of the

diagnosis factor storage unit 4 are changed (S30). More [concretely, since] specifically, because the actual measured value is reflected for the correction factor, the diagnosis factors r, s are both made closer to 1 by 0.01 so as to be r = 0.71, s = 1.29, which are written into the diagnosis factor storage unit 4.

Paragraph beginning at page 23, line 15 has been amended as follows:

[Since] Because the diagnosis has the result of abnormal (S27: NO), "abnormal" is outputted and displayed in the output unit 7 (S31). Here, [since] because the abnormality is obtained, the correction factor and the diagnosis factor are not changed.

Paragraph beginning at page 24, line 9 has been amended as follows:

[Since] Because the diagnosis has the result of normal (S27: YES), "normal" is outputted and displayed in the output unit 7 (S28). In addition, the correction factor v of the correction factor storage unit 14 is changed (S29). More [concretely] specifically, the average value 1.2 between actual measured value (130) ÷ base value (100) = 1.3 and present v = 1.1 is written into the correction factor storage unit 14 as a new correction factor v. In addition, the diagnosis factors r, s of the diagnosis factor storage unit 4 are changed (S30). More concretely, since the actual measured value is reflected for the correction factor, the diagnosis factors r, s are both further made closer to 1 by 0.01 so as to be r = 0.72, s = 1.28, which are written into the diagnosis factor storage unit 4.

Paragraph beginning at page 24, line 21 has been amended as follows:

Here, though in this third embodiment the base value stored in the base value storage unit 13 is assumed not to change, it is preferable to change the base value to correspond to changes in the surrounding environment in the case that those changes are large, such as the construction of a large building in the neighborhood. At this time, as for the changed base value, a simulation result which is obtained again after taking respective conditions into consideration in the same manner as in the case of the initial value may be adopted or the actual measured value after the change of the environment may be adopted. In addition, though in the [concrete] specific example of the third embodiment the base value, the diagnosis reference value, or the like, are made to be different for every month, that period may be arbitrarily set and those values may be made different for each season (spring, summer, autumn and winter).

Paragraph beginning at page 26, line 22 has been amended as follows:

FIG. 9 and 10 are graphs showing the relationships between the measured value of the direct current voltage and the diagnosis reference value thereof in a particular installed photovoltaic power system (installation site: within Osaka city limits, installation direction: facing to the west, installation angle: 30 degrees, maximum electric power: 3 kW) in June. In the graph of FIG.9, [since] because the measured value and the diagnosis reference value satisfy the condition (1), the diagnosis has the result of normal. On the other hand, in the graph of FIG.10, [since] because the above values satisfy neither of the conditions of (5) nor (1), the diagnosis has the result of abnormal.

Paragraph beginning at page 27, line 8 has been amended as follows:

FIG.11 and 12 are graphs showing the relationships between the measured value of the electric energy and the diagnosis reference value thereof in the photovoltaic power system installed under the same condition as the above. In the graph of FIG.11, [since] because the measured value and the diagnosis reference value satisfy the condition (1), the diagnosis has the result of normal. On the other hand, in the graph of FIG.12, [since] because the above values do not satisfy the condition (5) and do not satisfy the condition (1) during the time period from 13:00 to 16:00, the diagnosis has the result of abnormal.

Paragraph beginning at page 28, line 15 has been amended as follows:

The alternating current electric energy of the reference output characteristic and the actually measured alternating current electric energy are compared (Step S47). In the case that the latter is larger than the former (S47: YES), [since] because the measured electric energy is [larger] greater than the reference electric energy, the system doesn't have any problems and the diagnosis has a result of no abnormality (Step S56).

Paragraph beginning at page 29, line 25 has been amended as follows:

In addition, the diagnosis apparatus in the first to the third embodiments may be built in, in advance, in the installed photovoltaic power system or may be attached to the photovoltaic power system through connection at the time of the diagnosis process. Furthermore, [though] although a photovoltaic power system wherein the output from the power adjuster 24 is directly supplied to the load 26 is described in the first to the third embodiments, the present invention is, of course, not

limited to this but, rather, can be applied to a photovoltaic power system which is systematically connected to a commercial power source.

Paragraph beginning at page 30, line 10 has been amended as follows:

Here, [though] although in a newly installed photovoltaic power system, the above described diagnosis reference values in the first and second embodiments, as well as the base value in the third embodiment, are obtained by considering the installation condition, in the case that another photovoltaic power system exists in the vicinity wherein this condition is the same, or similar, it is possible to utilize the diagnosis reference value, the base value or the actual output characteristic (measured value) as it is, or after a fine adjustment, for the above diagnosis reference value and for the above base value. In addition, in the case that such a photovoltaic power system does not exist in the vicinity, it is also possible to acquire such pieces of information from a photovoltaic power system during operation which is installed in a remote location.

Paragraph beginning at page 32, line 2 has been amended as follows:

In addition, in the present invention, [since] because the past output characteristic is stored so that the past output characteristic is taken into consideration to diagnose the normality/abnormality of the output of the photovoltaic power system and, at the same time, to diagnose the cause of the case of abnormal output if necessary, it becomes possible to gain a precise diagnosis result which reflects the effect of the characteristic particular to the photovoltaic power system to be diagnosed.

Paragraph beginning at page 32, line 21 has been amended as follows:

In addition, in the present invention, [since] because reference output characteristics different for each of the plurality of periods of time gained by dividing a year are set by taking the seasonal changes in the meteorological condition into consideration, the reference output characteristic that is always optimal throughout the year can be obtained so that it becomes possible to quickly gain a precise diagnosis result.

Paragraph beginning at page 33, line 10 has been amended as follows:

In addition, in the present invention, [since] because at least, direct current voltage, alternating current voltage, direct current electric energy, alternating current electric energy, are used as the reference output characteristic and the output characteristic, diagnosis can be carried out from multiple aspects so that it becomes possible to correctly diagnose not only the cause of the abnormal component but also to correctly diagnose other causes.

Paragraph beginning at page 33, line 17 has been amended as follows:

In addition, in the present invention, [since] because the actual amount of solar radiation is measured, the data of the amount of solar radiation can be acquired as the data for diagnosis so as to carry out a diagnosis from multiple aspects of a greater number.

Paragraph beginning at page 33, line 21 has been amended as follows:

Furthermore, in the present invention, [since] because the reference output characteristic is acquired from another photovoltaic power system of which the installation condition and system characteristic are similar, it becomes possible to more easily obtain a precise reference output characteristic.

IN THE CLAIMS:

Please amend claims 1, 5, 9, 10, 16, 19 and 22 as follows:

1. (Amended) A method for diagnosing the normality/abnormality of an output of an installed photovoltaic power system, comprising the steps of:

comparing a reference output characteristic obtained in accordance with an installation condition of said photovoltaic power system with [an] a measured output characteristic in said photovoltaic power system obtained during operation; and

diagnosing the normality/abnormality of the output of said photovoltaic power system based on the comparison result,

wherein said photovoltaic power system is diagnosed as normal only if said measured output characteristic is greater than a first predetermined value and less than a second predetermined value, said first and second predetermined values being based on said reference output characteristic.

5. (Amended) A method for diagnosing the normality/abnormality of an output of an installed photovoltaic power system, comprising the steps of:

calculating a reference output characteristic at the time of normal operation in accordance with an installation condition of said photovoltaic power system;

measuring an output characteristic in said photovoltaic power system obtained during operation;

comparing the calculated reference output characteristic with the measured output characteristic; and

diagnosing the normality/abnormality of the output of said photovoltaic power system based on the comparison result.

9. (Amended) A method for diagnosing the normality/abnormality of an output of a photovoltaic power system, comprising the step of:

diagnosing the normality/abnormality of the output of said photovoltaic power system during operation based on a past measurement result of an output characteristic of said photovoltaic power system.

10. (Amended) A method for diagnosing the normality/abnormality of an output of a photovoltaic power system, comprising the steps of:

obtaining a reference output characteristic at the time of normal operation in accordance with a past measurement result of an output characteristic of said photovoltaic power system;

measuring an output characteristic in said photovoltaic power system during operation;

comparing the obtained reference output characteristic with the measured output characteristic; and

diagnosing the normality/abnormality of the output of said photovoltaic power system based on the comparison result.

16. (Amended) An apparatus for carrying out a diagnosis of the normality/abnormality of an output of an installed photovoltaic power system and/or a diagnosis of the cause [in the case that] whenever the output of said photovoltaic power system is abnormal, comprising:

a storage unit for storing a reference output characteristic which has been obtained in advance in accordance with an installation condition of said photovoltaic power system;

a measurement unit for measuring an output characteristic in said photovoltaic power system during operation; and

a comparison unit for comparing the reference output characteristic stored in said storage unit with the measured output characteristic [measured] obtained by said measurement unit,

wherein said photovoltaic power system is diagnosed as normal only if said measured output characteristic is greater than a first predetermined value and less than a second predetermined value, said first and second predetermined values being based on said reference output characteristic.

19. (Amended) An apparatus for carrying out a diagnosis of the normality/abnormality of an output of an installed photovoltaic power system and/or a diagnosis of the cause in the case that the output of said photovoltaic power system is abnormal, comprising:

an input unit for accepting an input of an installation condition of said photovoltaic power system;

a calculation unit for calculating a reference output characteristic of said photovoltaic power system, in accordance with the installation condition inputted to said input unit;

a measurement unit for measuring an output characteristic in said photovoltaic power system during operation; and

a comparison unit for comparing the reference output characteristic calculated by said calculation unit with the measured output characteristic [measured] obtained by said measurement unit.

22. (Amended) An apparatus for carrying out a diagnosis of the normality/abnormality of an output of a photovoltaic power system, comprising:

a storage unit for storing a past measurement result of an output characteristic of said photovoltaic power system; and

a diagnosis unit for diagnosing the normality/abnormality of the output of said photovoltaic power system based on the measurement result stored in said storage unit.